

REMARKS

Claims 1, 2, and 4 to 29 are pending in the present application.

Claims 1 and 4 to 24 are rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,456,348 to Bryan-Brown et al. (hereinafter "the Bryan-Brown et al. patent").

The present invention is directed, *inter alia*, to a bistable nematic liquid crystal device comprising: a first cell wall and a second cell wall enclosing a layer of nematic liquid crystal material; electrodes for applying an electric field across at least some of the liquid crystal material; a surface alignment on the inner surface of at least the first cell wall providing alignment to the liquid crystal molecules; wherein the surface alignment comprises an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt two different tilt angles in substantially the same azimuthal direction; the arrangement being such that two stable liquid crystal molecular configurations can exist after suitable electrical signals have been applied to the electrodes.

The Bryan-Brown et al. patent describes a bistable nematic liquid crystal device in which the liquid crystal molecules are aligned by a surface alignment monograting. As described in the attached declaration by Dr. Stephen Kitson, an inventor of the present invention and one skilled in the art, the device of the Bryan-Brown et al. patent is a zenithal bistable nematic display ("ZBN" or "ZBD"), which neither describes nor suggests that which is recited in the claims of the present invention.

Applicants respectfully disagree with the Action and submit that the Bryan-Brown et al. patent fails to disclose or suggest a surface alignment comprising an array of posts, as in claim 1. The Action states that "Bryan-Brown discloses that both cell walls are embossed with small pillars (of 1-3 micrometers height and 5-50 micrometers or more width) in the inner surfaces to provide a grating wherein the pillars may be formed by the material of the alignment layers." As set forth in the attached declaration by Dr. Kitson, this statement is erroneous for at least the following reasons. As clearly set forth in the Bryan-Brown et al. patent at lines 59 to 60 of col. 3, the pillars are spacer pillars for assisting in correct spacing apart of the cell walls and also for providing a barrier to liquid crystal material flow when the cell is flexed. This is the only purpose set forth for the pillars in the Bryan-Brown et al. patent. Despite the fact that these spacer pillars may be formed by the material of the alignment layers, the spacer pillars of the Bryan-Brown et al. patent cannot effect a bistable alignment, as required by claim 1.

The bistable alignment in the Bryan-Brown et al. patent is provided by the monograting alone, as illustrated by the examples provided within that patent, which do not include any discussion of the spacer pillars. Therefore, the bistability is achieved without the use of these spacer pillars, as described in the actual experimental results of the Bryan-Brown et al. patent and the Wu & Yang book extract referenced in Dr. Kitson's declaration. It should also be noted that the spacer pillars cannot "provide a grating," as stated in the Action. Dr. Kitson's declaration clearly sets forth that the spacer pillars of the Bryan-Brown et al. patent are not a grating, that the grooves of the Bryan-Brown et al. patent provide the bistable alignment, and that the spacer pillars will not effect a bistable alignment, as required by claim 1.

Furthermore, the Bryan-Brown et al. patent clearly sets forth that the spacer pillars are present for the purpose of "assisting in correct spacing apart of the cell walls" and as "a barrier to liquid crystal material flow." As set forth in the Kitson declaration, to assist in the correct spacing apart of the cell walls, the

spacer pillars of the Bryan-Brown et al. patent themselves would be too tall to effect a bistable alignment. If they were to effect alignment at all, a single monostable alignment, such as a high tilt or homeotropic alignment, would be produced. The Kitson declaration also sets forth that the spacer pillars acting as a barrier to liquid crystal material flow would not produce a bistable alignment, even if the spacer pillars were made of the material of the alignment layers.

Still further, Dr. Kitson's declaration aptly points to a publication by G.P. Bryan-Brown himself that describes a ZBD device with pillars to aid spacing apart of the cell walls, such as the device in the Bryan Brown et al. patent. The publication states that “[o]bservation of the cell during switching showed that the pillars did not affect the stability of either state and do not significantly modify the switching in the region around the pillars. This is in contrast to other bistable LCD's where spacer pillars have been known to seed defects and compromise long term bistability.” Therefore, the spacer pillars of the Bryan-Brown et al. patent cannot possibly effect the bistability induced by the monograting and actually may “compromise” such bistability. As set forth in the Kitson declaration, “the spacer pillars do not themselves confer bistability on a nematic liquid crystal display, even if formed of the same material as the alignment layers.”

The Bryan-Brown et al. patent does not disclose or suggest a surface alignment comprising an **array of posts**, let alone an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt **two different tilt angles** in substantially the same azimuthal direction, the arrangement being such that **two stable** liquid crystal molecular configurations can exist, as required by claim 1.

Accordingly, Applicants respectfully submit that claim 1 is patentably distinguishable over the cited reference and, thus, is in a condition for allowance.

Applicants respectfully submit that claims 4 to 24, which depend from claim 1, are also patentably distinguishable over the cited art for at least the reasons discussed above with respect to claim 1.

Claim 6 adds the element to claim 1 that at least part of a side wall of the posts is tilted at a tilt angle with respect to the normal to the plane of the first cell wall. Claim 7 adds the element to claim 6 that the tilt angle is in the range of about 5 to 7 degrees.

Applicants respectfully submit that the Bryan-Brown et al. patent does not disclose or suggest at least part of a side wall of the posts being tilted at a tilt angle with respect to the normal to the plane of the first cell wall, let alone at a tilt angle in the range of about 5 to 7 degrees. The Action states that "since Bryan-Brown discloses that the rubbing direction on the polyimide surface is set parallel to the grating groove direction on the grating surface and by arranging the groove directions non parallel to the rubbing alignment direction about 5 degrees, the twist disclinations may be prevented." The Action further states "the rubbing will be normal to the plane of the cell wall when the post is squared (the side wall of the post is normal to the plane of the cell wall); therefore, the grating groove direction is set to be tilted (or non parallel) at 5 degrees to the rubbing alignment directions to prevent disclinations." Somehow the action attempts to equate this to mean the side wall of the posts is tilted, as required by claims 6 and 7. However, the Action is unclear as to how that logic progresses and has not clearly pointed to a passage in the Bryan-Brown et al. patent to support such a statement. Even if there were support for the statement in the Bryan-Brown et al. patent, the fact that the grating groove direction may be non parallel to the rubbing alignment direction about 5 degrees does not describe or suggest that a side wall of the posts is tilted. First, as discussed above, the Bryan-Brown et al. patent does not disclose or suggest the alignment posts of claim 1, from which claims 6 and 7 depend. Therefore, the Bryan-Brown et al. patent clearly does not disclose or suggest a side wall of an alignment post being tilted.

Further, as set forth in Dr. Kitson's declaration, the Bryan-Brown et al. patent is describing in Example 3, col. 9, lines 10 to 58, a well known method of preventing twist disclinations involving offsetting the alignment rubbing direction in the plane of the second cell wall from being parallel to the groove direction in the first cell wall. One skilled in the art would clearly recognize the description in the Bryan-Brown et al. patent to require the rubbing direction to remain in the plane of the second cell wall as it is offset from parallel to the groove directions in the second cell wall.

Accordingly, Applicants respectfully submit that claims 6 and 7 are further patentably distinguishable over the prior art and are, thus, in a condition for allowance.

Claim 10 adds the element to claim 1 that the posts are arranged in one of a random or pseudorandom array. The Action states that col. 3, lines 46 to 49, of the Bryan-Brown et al. patent discloses posts that are arranged in one of a random or pseudorandom array. The relevant portion of the cited area states "The gratings may be applied to both cell walls and may be the same or different shape on each wall. Furthermore, the grating profile may vary within each pixel area, and or in the inter pixel gaps between electrodes." As discussed above, the Bryan-Brown et al. patent does not disclose or suggest alignment posts, let alone alignment posts that are arranged in one of a random or pseudorandom array. Further, as set forth in Dr. Kitson's declaration, variation in the shape or profile of the grating, as described in this citation at col. 3, does not make the arrangement of the **array** random or pseudorandom. Applicants respectfully submit that the Bryan-Brown et al. patent does not disclose or suggest posts that are arranged in one of a random or pseudorandom array, as required by claim 10.

Accordingly, Applicants respectfully submit that claim 10 is further patentably distinguishable over the prior art and is, thus, in a condition for allowance.

Claim 28 and 29 are rejected under 35 U.S.C. § 102(e) as being anticipated by the Bryan-Brown et al. patent.

Applicants respectfully submit that, as discussed above with respect to claim 1, the Bryan-Brown et al. patent fails to disclose or suggest a surface alignment comprising an array of posts, let alone an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt two different tilt angles in substantially the same azimuthal direction, as required by claim 28. Accordingly, claim 28 is patentably distinguishable over the prior art and, thus, is in a condition for allowance.

Applicants respectfully submit that, as discussed above with respect to claim 1, the Bryan-Brown et al. patent fails to disclose or suggest a surface alignment comprising an array of posts, let alone an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt two different tilt angles in substantially the same azimuthal direction, as required by claim 29. Accordingly, claim 29 is patentably distinguishable over the prior art and, thus, is in a condition for allowance.

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over the Bryan-Brown et al. patent in view of PCT Publication WO 01/34251 to Jones et al. (hereinafter “the Jones et al. application”).

The Bryan-Brown et al. patent is described above. The Jones et al. application describes a bistable nematic liquid crystal device in which one cell wall has a grating structure capable of sustaining two stable states in which the liquid crystal director is in the same azimuthal plane but at two different tilt angles

out of the plane of the cell. The second cell wall has a monostable surface which leads to substantially planar homogeneous alignment. The monostable surface can be formed from a rubbed polymer or a grating surface.

Claim 2 depends from claim 1 and adds the features that the liquid crystal material has negative dielectric anisotropy, and that the second cell wall has a surface alignment which induces a local homeotropic alignment of the director.

Applicants respectfully submit that, as discussed above, the Bryan-Brown et al. patent fails to disclose or suggest a surface alignment comprising an array of posts, as required by claim 1. The Bryan-Brown et al. patent describes the use of a liquid crystal material with a positive dielectric anisotropy and, as admitted by the Action, fails to disclose or suggest that the liquid crystal material has a negative dielectric anisotropy, as recited in claim 2.

The Jones et al. application fails to cure the substantial deficiencies of the Bryan-Brown et al. patent. Specifically, the Jones et al. application fails to disclose or suggest a surface alignment comprising an array of posts which have at least one of a shape and an orientation to induce a liquid crystal director adjacent the posts to adopt two different tilt angles in substantially the same azimuthal direction, as required by claim 1 and, thus, claim 2. The Action further states that the Jones et al. application discloses a surface alignment on the second cell wall that induces a local homeotropic alignment of the director. As set forth in Dr. Kitson's declaration, this statement is false. According to the Kitson declaration, the passage of the Jones et al. application relied upon by the Action refers only to homeotropic orientation at the grating surface on the first cell wall. Also according to the Kitson declaration, page 7, lines 27 to 30 of the Jones et al. application clearly discloses that the surface of the second cell wall must not be homeotropic. Therefore, the Jones et al. application teaches away from a combination that would yield a second cell wall that has a surface alignment which induces a local homeotropic alignment, as required by claim 2.

Therefore, there would be no motivation for one of ordinary skill in the art to modify the liquid crystal device having a grating surface alignment, a liquid crystal material of positive dielectric anisotropy, and monostable homeotropic second surface of the Bryan Brown et al. patent with the liquid crystal device having a grating surface alignment, a liquid crystal material of negative dielectric anisotropy, and a monostable substantially planar second surface of the Jones et al. patent to arrive at the liquid crystal device of claim 2. Even if one could be motivated to combine the references, which is not admitted here, both the Bryan-Brown et al. patent and the Jones et al. patent fail to disclose or suggest a surface alignment comprising an array of posts, as in claim 1 and thus claim 2. Applicants respectfully submit that claim 2 is patentably distinguishable over the cited art and the cited combination. Reconsideration and withdrawal of the § 103(a) rejection of the claim is respectfully requested.

Claims 25 to 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Bryan-Brown et al. patent.

Claim 25 depends from claim 6, which depends from claim 1. Claim 25 adds the element that the posts are cylindrical.

Applicants respectfully submit that the Bryan-Brown et al. patent does not disclose or suggest an array of posts as discussed above with respect to claim 1 or a side wall of a post that is tilted as discussed above with respect to claim 6. Further, as set forth in Dr. Kitson's declaration, there is no disclosure or suggestion anywhere in the Byran-Brown et al. patent of posts that are cylindrical. The passage relied upon by the Action describes only the shape of the alignment grating. The alignment posts of the present invention are clearly not an alignment grating. The Action states that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to produce a desired grating profile for the post which is cylindrical." As stated in the Kitson

declaration an alignment post does not have "a grating profile." Accordingly, the Bryan-Brown et al. patent does not disclose or suggest a post that is cylindrical.

Applicants respectfully submit that claim 25 is patentably distinguishable over the cited prior art and, thus, is in a condition for allowance.

Claim 26 depends from claim 6, which depends from claim 1. Claim 26 adds the element that the posts have a square cross section.

Applicants respectfully submit that the Bryan-Brown et al. patent does not disclose or suggest an array of posts as discussed above with respect to claim 1 or a side wall of a post that is tilted as discussed above with respect to claim 6. Also, as discussed above with respect to claim 25, posts are not gratings and they do not have a grating profile. Thus, the alignment posts of claim 26 clearly do not have a "grating profile...that has a cross section selected from a square shape," as stated in the Action. Further, as set forth in Dr. Kitson's declaration, there is no disclosure or suggestion anywhere in the Byran-Brown et al. patent of posts that have a square cross section, as required by claim 26.

Applicants respectfully submit that claim 26 is patentably distinguishable over the cited prior art and, thus, is in a condition for allowance.

Claim 27 depends from claim 1. Claim 27 adds the element that the posts have a cross section selected from an oval shape and a diamond shape.

Applicants respectfully submit that the Bryan-Brown et al. patent does not disclose or suggest an array of posts as discussed above with respect to claim 1. Also, as discussed above with respect to claim 25, posts are not gratings and they do not have a grating profile. Thus, the alignment posts of claim 27 clearly do not have a "grating profile...that has a cross section selected from a square shape, or an oval shape or a diamond shape" as stated in the Action. Further, as

set forth in Dr. Kitson's declaration, there is no disclosure or suggestion anywhere in the Byran-Brown et al. patent of posts that have a cross section selected from an oval shape and a diamond shape, as required by claim 26.

Applicants respectfully submit that claim 27 is patentably distinguishable over the cited prior art and, thus, is in a condition for allowance.

Accordingly, Applicants respectfully submit that all claims presented in this application patentably distinguish over the prior art and combinations thereof. Therefore, Applicants respectfully request favorable consideration and passage of the application to allowance.

Respectfully submitted,



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